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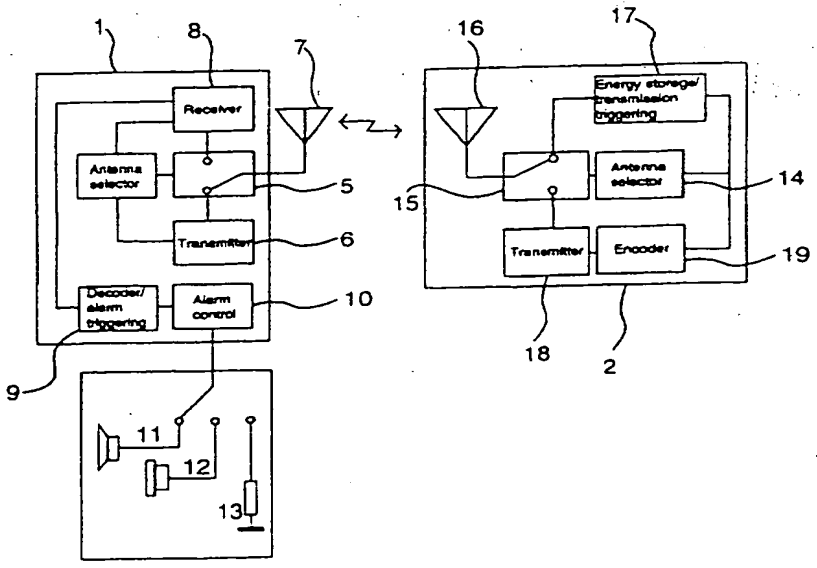

(57) Abstract

The invention relates to a system for preventing leaving behind a portable device and for reminding of taking along the device, comprising means (10, 11, 12, 13) for giving an alarm. The system further comprises a detector (2) arranged in connection with the device, provided with means (16, 18, 19) for transmitting a code stored in the detector (2), and a code reading device (1) equipped with means (7, 8, 9) for decoding the code transmitted by the detector (2).

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System for preventing leaving behind of a portable device and for reminding of taking along of the device

The present invention relates to a system as set forth in claim 1, for preventing the leaving behind of a portable device.

Several portable devices are intentionally made compact-sized and light-weight, so that carrying them along will not become an unreasonable load. In addition to the fact that several portable devices have become smaller and lighter, also their price has come down, whereby an increasing number of people has been able to acquire e.g. a video camera, a photographic camera, a portable computer, or a mobile telephone. In spite of the reduced size and prices of the devices, the devices are more versatile than before.

With an increase in the production numbers of portable mobile phones, their prices have sunk to a level which has made it possible for an increasing number of people with normal income to acquire a mobile phone. The numbers of telephones have increased, and new models are constantly being introduced to the market, which are considerably lighter in weight than previous phones. The newest mobile phone models having entered the market and their weight having become lighter, problems have occurred in their use, such as leaving behind or losing a light mobile phone.

When using a mobile phone, one often forgets to put it back in a pocket or in a portable housing for the mobile phone. Instead, one easily leaves the mobile phone on a table, on the dash board of a car or in a similar place. A corresponding problem of leaving behind occurs also with other portable devices; for example, after shooting an interesting place or event with a video camera, the camera is placed *e.g.* on a table, where it is easily left behind. This forgetting can be detected first at the stage when one would need the device again. At this stage, one may have moved very far from the place where the portable device was left, whereby its retrieval can be very difficult or even impossible. Furthermore, a device left on a table can be easily stolen.

Attempts for solving the problem of leaving behind a portable phone have been made for example in a way disclosed in European patent application EP-581416. The system described in said publication is based on monitoring signals transmitted by the transmitter of the mobile station. The alarm system includes a receiver, whereby the receiver is tuned to the frequency range used by the transmitter of the mobile phone. In the alarm device, the presence of signals in the transmitting frequency are monitored, whereby an alarm is made in a case that the strength of a signal in the transmitting frequency is reduced to a pre-set limit value. This is the situation *e.g.* when the distance of the mobile station to the receiver of the alarm system is increased to a sufficient length. However, the system presented in this publication has the disadvantage that the receiver makes no distinction whether the received signal of the transmitting frequency belongs specifically to the mobile phone to be monitored, whereby a turned-on mobile phone belonging to another person in the vicinity may prevent the giving of an alarm, even though the mobile phone to be monitored would be left *e.g.* on a table. Moreover, this system has the disadvantage that the receiver only monitors a mobile phone turned on, wherein the mobile phone can be left behind in spite of the system, if the mobile phone is turned off. For example, the mobile phone can be turned off for the time of a meal, wherein the mobile phone can be easily left on the table in a restaurant when the owner is leaving the restaurant.

Consequently, the solution presented in the European patent application EP-581416 requires that the device to be monitored is equipped with a radio transmitter, whereby the signal transmitted from the transmitter is monitored. In many portable devices, such a radio transmitter is not necessary, wherein supplying it only for the purpose of preventing the leaving behind of the portable device is not reasonable and will raise the manufacturing costs of the portable device.

The purpose of the present invention is to eliminate the above-mentioned advantages to a large extent and to provide a system for preventing the leaving behind of a portable device, which system reminds of taking along the device or of putting it back *e.g.* to a sling or a charging device. The invention is based on the idea that the portable device is provided with a detector device and the user of the device has

a code reading device. A code, which is preferably different for different code reading devices, is stored in the code reading device. The code is transmitted at certain intervals to the code reading device, whereby the code reading device examines if the code is received within the set time interval. The code reading device gives an alarm in a case that the code is not received within a certain time interval. The present invention is characterized in what will be presented in the characterizing part of the appended claim 1.

In the system according to the first embodiment of the invention, a so-called passive detector is used, which receives its driving energy from the electromagnetic field transmitted by the code reading device.

The system according to the second embodiment of the invention is based on a so-called active detector device, *i.e.* the detector device has its own power supply or it is supplied with energy from an external power supply.

The present invention gives considerable advantages to the systems of prior art for preventing the leaving behind of a portable device. The system according to the invention functions also in a situation that the portable device is turned off, which is necessary in many cases. Furthermore, the system according to the first embodiment of the invention requires no separate power supply, whereby the detector can be made compact and light in weight. Moreover, the system according to the invention gives the advantage that other portable devices possibly nearby do not disturb the operation of the system, wherein an alarm is given when the distance between the detector and the code reading device is extended to a sufficient length, irrespective of other portable devices nearby. The system uses a code which is common to both the detector and the code reading device but differs from the codes of other systems with a detector and a code reading device; consequently, several systems of the invention can be used simultaneously.

In the following, the invention will be described in more detail with reference to the appended drawings. In the drawings,

Fig. 1 shows a system according to the first advantageous embodiment of the invention in a reduced block diagram, and

Fig. 2 shows a system according to the second advantageous embodiment of the invention in a reduced block diagram.

In a system according to the first advantageous embodiment of the invention, a code reading device 1 carried by the user transmits a radio-frequency signal to a detector 2 which is installed in or in connection with a portable device. A code for identifying the detector is stored in the detector 2, wherein in a situation when several portable devices equipped with the system of the invention are close to each other, each detector 2 can be differentiated from each other. The detector 2 transmits the code to the code reading device 1 which receives the transmitted signal and reconstructs the code transmitted with the signal. If the distance between the detector integrated in or installed in connection with the portable device and the code reading device 1 carried along by the user of the device is extended to a sufficient length, the code reading device 1 cannot receive the transmitted code, wherein an alarm circuit 3 arranged in connection with the code reading device will give an alarm.

The code reading device 1 of the system according to Fig. 1 operates in the following way. An antenna selector 4, comprising advantageously a microcontroller (not shown), known as such, switches an antenna switch 5 to a position in which the transmitter 6 of the code reading device is coupled to the antenna 7 of the code reading device. The transmitter 6 of the code reading device transmits a high-frequency signal for transmission of electromagnetic energy as the driving energy to the detector 2. After a sufficient energy supply has been transmitted, the antenna selector 4 switches the switch 5 to a position in which the antenna 7 is coupled to the receiver 8 of the code reading device. The received signal is passed to a decoder 9, in which the received code is decoded from the signal. The received code is compared with the code stored in the code reading device 1, being thus the code corresponding to that in the detector 2 monitored by the code reading device 1. If the compared codes are identical, no alarm impulse will be given to an alarm control circuit 10. However, if the code was not correct, it is ex-

amined if the time passed from the last reception of the correct code is longer than the alarm time limit. If the time is shorter than the alarm time limit, no alarm impulse will be generated. However, if the time is longer than the alarm time limit, an impulse is given to the alarm control circuit 10, whereby the alarm control circuit 10 will generate an alarm. The alarm is given either with a speech synthesizer 11, a buzzer 12 or a vibratory alarm device 13.

The detector 2 shown in Fig. 1 operates in the following way. In the initial state, the antenna selector 14 of the detector, such as a microcontroller (not shown), guides the antenna switch 15 of the detector in a position in which the detector antenna 16 is coupled to an energy storage circuit 17 in the detector. Thus, if the detector 2 is sufficiently close to the code reading device 1, the energy storage circuit 17 will collect energy from the electromagnetic field received by means of the detector antenna 16. When there is sufficiently energy in the energy storage circuit 17 for the operation of the detector 2, the energy storage circuit 17 generates a triggering signal, on the basis of which the antenna selector 14 switches the antenna switch 15 of the detector to a transmission mode, *i.e.* the transmitter 18 of the detector is coupled to the antenna 16 of the detector. On the basis of the triggering signal, also an encoder 19 starts the transmission of the code stored in the encoder 19 to the transmitter 18. The transmitter 18 generates a modulated high-frequency signal which is passed to the antenna 16. Thus, the modulated signal includes the code for identifying the detector 2. If the code reading device 1 is sufficiently close to the detector 2, the code reading device 1 receives the transmitted signal, as presented above in this description. After transmission of the code, the detector 2 returns to the initial state, *i.e.* the antenna selector 14 of the detector switches the antenna switch 15 of the detector to the receiving mode. The energy storage circuit 17 of the detector comprises means known as such, including a rectifier and a capasitor, for rectifying and storing the energy contained in the received high-frequency signal.

If the distance between the code reading device 1 and the detector 2 is too long, the detector 2 cannot receive sufficiently or any high-frequency energy, wherein the detector 2 cannot transmit the code.

Figure 2 shows a second advantageous embodiment of the invention, in which a so-called active detector is used, operating in the following way: The detector 2 is equipped with a power supply 20 of its own, or the driving energy is conveyed to the detector 2 from a mobile phone, the detector 2 being installed in connection with the same. A timer 21 gives the encoder 19 a starting pulse at regular intervals. The starting pulse starts transmission of the code, *i.e.* the encoder 19 transmits the stored code that identifies the detector 2 to the transmitter 18. The transmitter 18 generates a modulated high-frequency signal which is passed to the antenna 16 of the detector for transmission. If the code reading device 1 is sufficiently close to the detector 2, the antenna 7 of the code reading device receives the transmitted high-frequency signal and passes it on to the receiver 8, in which the high-frequency signal is demodulated in a manner known as such, whereby the code can be transmitted to the decoder 9 for interpretation. If the received code was correct, the decoder 9 resets the time counter of the timer 22 of the code reading device 1 to zero. If the distance between the detector 2 and the code reading device 1 is increased to a length that the signal transmitted by the detector 2 cannot be received by the code reading device 1, the timer 22 gives a triggering pulse to the alarm control circuit 10 after the time counter has reached a certain value, *i.e.* the watch period has expired. The alarm control operates as presented above in the description of the system according to the first advantageous embodiment of the invention.

Moreover, the system according to the invention can be applied in a way that one code reading device 1 monitors simultaneously two or more portable devices, whereby each portable device is equipped with a separate detector 2 in which the code for identifying the device to be monitored is stored. In a corresponding manner, the code reading device 1 includes a code for each device, against which the code given by the detector 2 will be compared each time. Thus, the code reading device 1 is advantageously equipped with means (not shown) by which the code reading device 1 controls the detectors 2 in a way that each detector in turn transmits its own code to be received by the code reading device 1. This periodic reading of the code included in the detectors 2 can be established for example in a way that the code reading device 1 transmits synchronization data, whereby the first

detector in the system starts transmitting a code which is received by the code reading device 1 which takes the measures corresponding to those presented above in connection with the first advantageous embodiment of the invention. This transmission of the code is reserved a certain period of time, after which the second detector in the system transmits its own code to be received by the code reading device 1 again. After all the codes of the detectors 2 in the system have been read and examined, the code reading device 1 transmits a new synchronization pulse, on the basis of which the detectors 2 are synchronized and transmit their own codes in the correct time period.

In the case that the detectors 2 used are passive detectors, as in the first advantageous embodiment of the invention, the code reading device 1 must also transmit an energy pulse in each time period for supplying the driving energy for each detector 2. When active detectors 2 are used, such energy transmission will not be necessary.

In a system of several detectors 2, each detector can also have the same code, because the detectors send their own code preferably within a predetermined time period, wherein the code reading device 1 is capable of using the time period to find out from which detector 2 the code is expected.

The invention is not restricted solely to the embodiments presented above, but it can be modified within the scope of the appended claims.

Claims:

1. System for preventing leaving behind of a portable device and for reminding of taking along of the device, comprising means (10, 11, 12, 13) for giving an alarm, **characterized** in that the system comprises further a detector (2) arranged in connection with the device, provided with means (16, 18, 19) for transmitting a code stored in the detector (2), and a code reading device (1) equipped with means (7, 8, 9) for decoding the code transmitted by the detector (2).

2. System according to claim 1, **characterized** in that the driving energy for the detector (2) is arranged to be passed from the code reading device (1) preferably as electromagnetic energy.

3. System according to claim 1, **characterized** in that the detector (2) comprises means (14, 17) for controlling the transmission of the code.

4. System according to claim 2 or 3, **characterized** in that the code reading device (1) comprises a transmitter (6) for generating electromagnetic energy and transmitting it to the detector (2).

5. System according to claim 1, **characterized** in that the detector (2) comprises a power supply (20) for supplying driving energy to the detector (2).

6. System according to any of the claims 1 to 5, **characterized** in that the transmission of the code stored in the detector (2) is arranged to take place at regular intervals, wherein the code reading device (1) comprises means (9, 22) for measuring time.

7. System according to claim 6, **characterized** in that the code reading device (1) comprises means (9) for resetting the time counter of the timer (22) to zero in connection with receiving the code transmitted by the detector.

8. System according to claim 6 or 7, **characterized** in that the code reading device (1) comprises means (9) for triggering the alarm of the

timer (22) when the time counter has exceeded a predetermined limit value and means (10, 11, 12, 13) for giving an alarm.

9. System according to any of the claims 1 to 8, **characterized** in that the portable device is a mobile telephone.

10. System according to any of the claims 1 to 8, **characterized** in that the portable device is a portable data processor, such as a computer.

11. System according to any of the claims 1 to 8, **characterized** in that the portable device is a video camera.

12. System according to any of the claims 1 to 8, **characterized** in that the portable device is a photographic camera.

13. System according to any of the claims 1 to 12, **characterized** in that the means (10, 11, 12, 13) for giving an alarm comprise a speech synthesizer (11), a buzzer (12) or a vibratory alarm device (13).

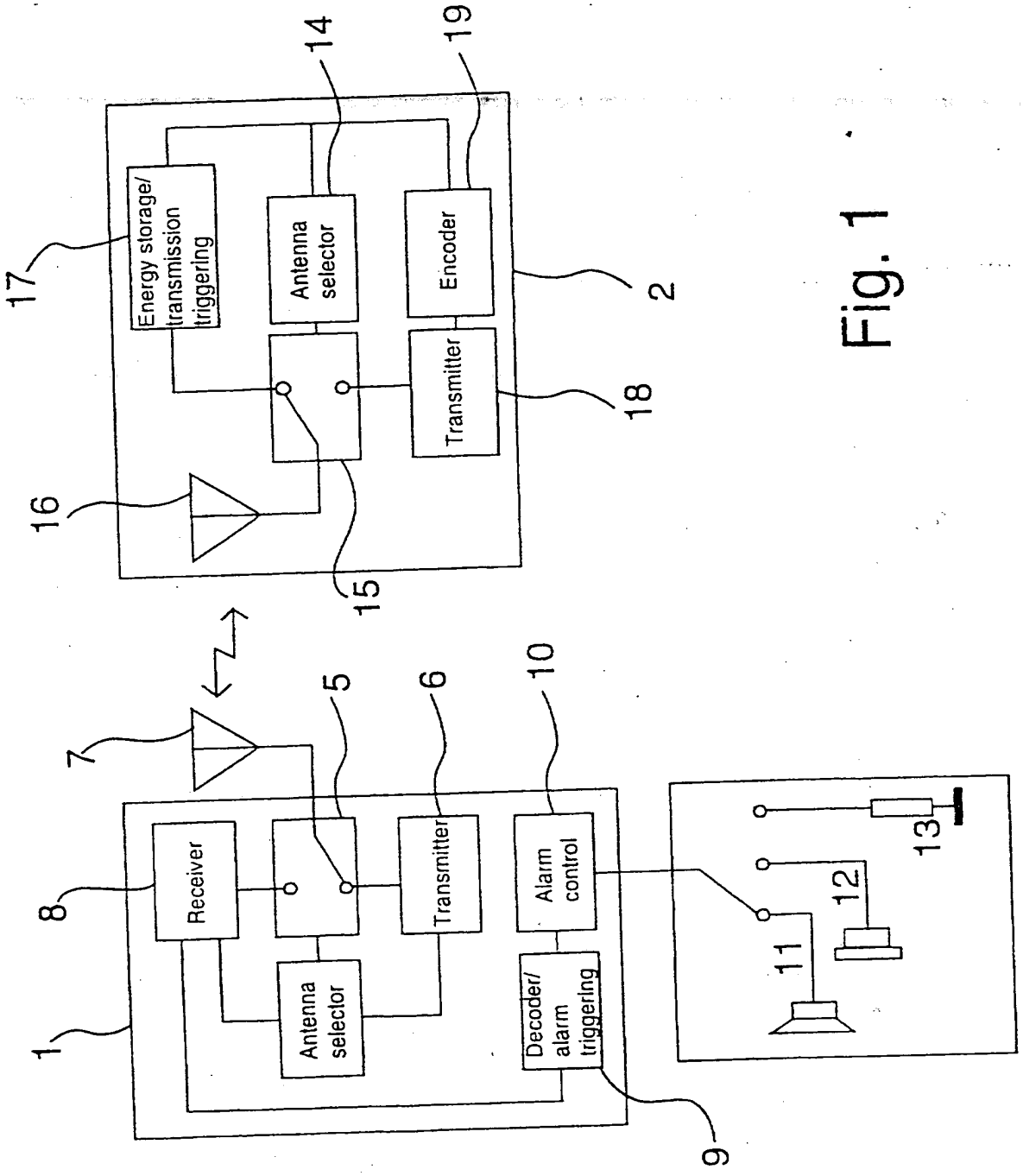
Energy storage/ transmission triggering
Antenna selector
Encoder
Transmitter
Receiver
Antenna selector
Transmitter
Alarm control
Decoder/ alarm triggering
1
2
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19

Fig. 1

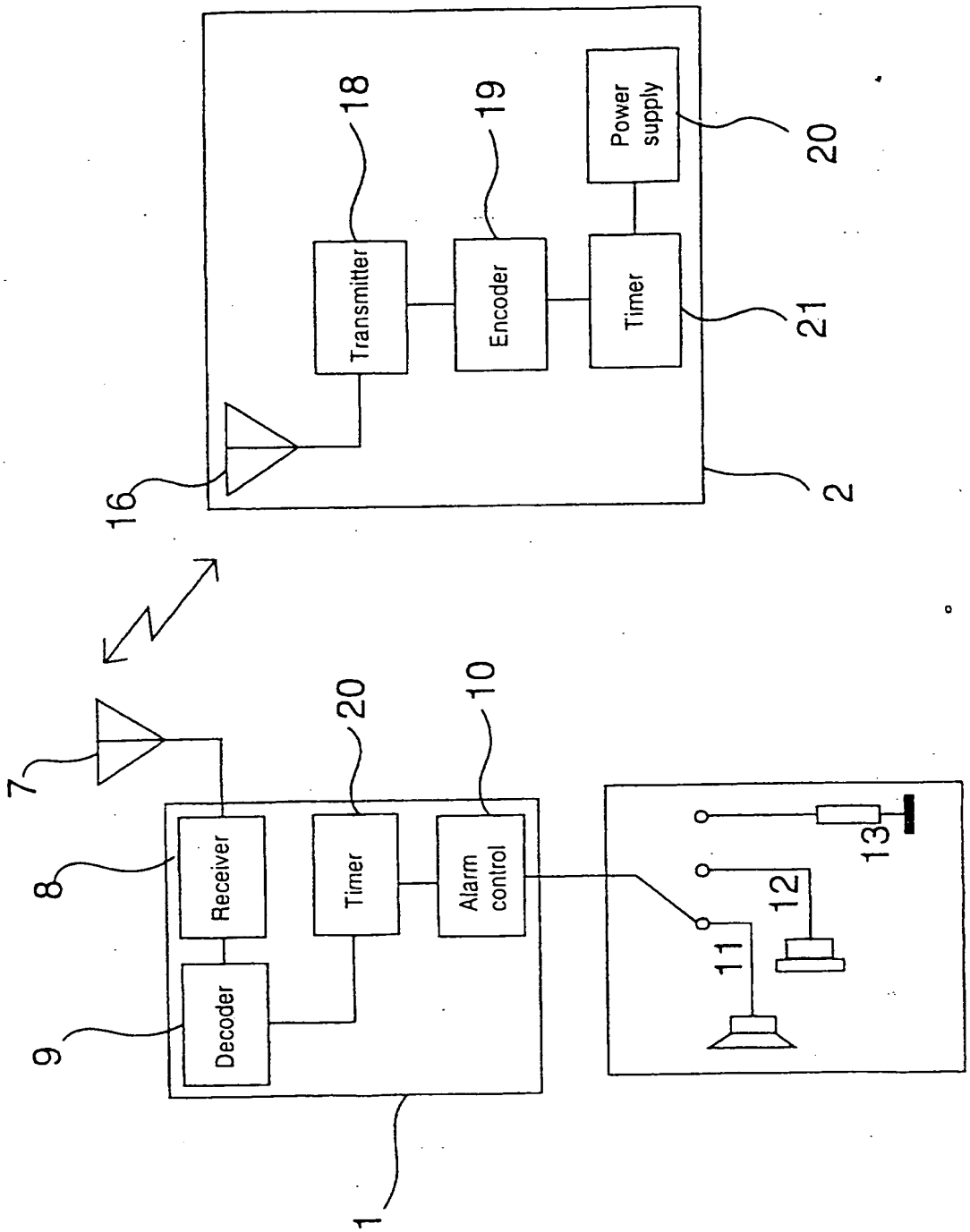
Power supply
18
19
20
Transmitter
Encoder
Timer
21
16
2
7
20
10
8
Receiver
Timer
Alarm control
13
12
11
9
Decoder
1

Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 97/00312

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: G08B 21/00, G08B 1/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4792796 A (L. BRADSHAW ET AL.), 20 December 1988 (20.12.88), column 2, line 14 - column 3, line 60	1,3,5-13
X	US 5086290 A (S.G. MURRAY ET AL.), 4 February 1992 (04.02.92), column 1, line 56 - column 2, line 68, abstract	1,3,5-13
X	US 5406256 A (J.W. LEDEL ET AL.), 11 April 1995 (11.04.95), column 1, line 58 - column 2, line 3; column 4, line 46 - line 60	1,3,5-13

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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International application No.
PCT/FI 97/00312

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0649122 A1 (SIEMENS AKTIENGESELLSCHAFT), 19 April 1995 (19.04.95), column 2, line 27 - line 41	2,4,5
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X	column 3, line 14 - line 19	13
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A	US 5402104 A (L. LAROSA), 28 March 1995 (28.03.95), column 1, line 6 - line 56, abstract	1-13
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INTERNATIONAL SEARCH REPORT

Information on patent family members

01/10/97

International application No.
PCT/FI 97/00312

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US 5402104 A	28/03/95	NONE	